## Claim Amendments

Please amend claims 1, 10, 18, and 23 as follows:

Please cancel claims 30-41 as follows:

Please add new claims 42-52 as follows:

## Claims as Amended

1. (currently amended) A method for forming a copper damascene comprising the steps of:

providing a substrate comprising a semiconductor substrate;

forming an insulator layer on the substrate;

forming a damascene opening through a thickness portion of the insulator layer;

forming a diffusion barrier layer to line the damascene opening;

then forming a first seed layer ~~overlying~~ on the diffusion

barrier;

then plasma treating the first seed layer in-situ with a first treatment plasma ~~comprising~~ formed from plasma source gases selected from the group consisting of argon, nitrogen, hydrogen, and $NH_3$;

then forming a second seed layer ~~overlying~~ on the first seed layer;

forming a copper layer overlying the second seed layer according to an electro-chemical plating (ECP) process to fill the damascene opening; and,

planarizing the copper layer to form a metal interconnect structure.

2. (original) The method of claim 1, wherein at least one of the first and second seed layers forms a continuous layer over active areas of the substrate.

3. (original) The method of claim 1, wherein at least the second seed layer forms a continuous layer over active areas of the

substrate.

4. (original) The method of claim 1, wherein one of the first and second seed layers is substantially nonconformally deposited.

5. (original) The method of claim 1, wherein one of the first and second seed layers is substantially conformally deposited.

6. (original) The method of claim 1, wherein the first seed layer is deposited according to a deposition process selected from the group consisting of CVD, IMP, SIP, and electroless.

7. (original) The method of claim 6, wherein the second seed layer is deposited according to a PVD process.

8. (original) The method of claim 1, wherein the first seed layer is deposited according to a PVD process.

9. (original) The method of claim 8, wherein the second seed layer is deposited according to a deposition process selected from the group consisting of CVD, IMP, SIP, and electroless.

10. (currently amended) The method of claim 1, further comprising

the step of plasma treating the second seed layer with a second treatment plasma formed ~~of~~ from plasma source gases selected from the group consisting of argon, nitrogen, and hydrogen prior to the step of forming the copper layer.

11. (original) The method of claim 1, wherein the plasma source gases consist essentially of plasma source gases selected from the group consisting of argon (Ar), nitrogen ($N_2$), hydrogen ($H_2$), ammonia ($NH_3$), and a nitrogen/hydrogen ($N_2/H_2$) mixture.

12. (original) The method of claim 1, wherein the first and second seed layers comprise a material selected from the group consisting of Cu, Ti, TiN, Ta, TaN, Cr, CrN, W, and WN.

13. (original) The method of claim 1, wherein at least one of the first and second seed layers is formed of copper or alloy thereof.

14. (original) The method of claim 1, wherein the insulator layer comprises a low-K dielectric insulator having a dielectric constant of less than about 3.0.

15. (original) The method of claim 1, wherein the first seed

layer is formed having a thickness of about 50 Angstroms to about 300 Angstroms.

16. (original) The method of claim 1, wherein the second seed layer is formed having a thickness of about 100 Angstroms to about 400 Angstroms.

17. (original) The method of claim 1, wherein the diffusion barrier layer comprises a material selected from the group consisting of Ti, TiN, Ta, TaN, Cr, CrN, W, and WN.

18. (currently amended) A method for forming a copper damascene comprising the steps of:

providing a substrate comprising a semiconductor substrate and metal interconnect structures;

forming a low-K dielectric insulator layer on the substrate;

forming a damascene opening through a thickness portion of the low-K dielectric insulator layer;

forming a diffusion barrier layer to line the damascene

opening;

then forming a first seed layer over the diffusion barrier layer;

then plasma treating the first seed layer with a first treatment plasma ~~comprising~~ formed from plasma source gases selected from the group consisting of argon, nitrogen, hydrogen, and $NH_3$;

then forming a second seed layer ~~over~~ on the first seed layer;

then plasma treating the second seed layer with a second treatment plasma ~~comprising~~ formed from plasma source gases selected from the group consisting of argon, nitrogen, hydrogen, and $NH_3$;

forming a copper layer over the second seed layer according to an electro-chemical plating (ECP) process to fill the damascene opening; and,

planarizing the copper layer to form a metal interconnect

structure.

19. (original) The method of claim 18, wherein the first seed layer is deposited according to a deposition process selected from the group consisting of CVD, IMP, SIP, and electroless.

20. (original) The method of claim 19, wherein the second seed layer is deposited according to a PVD process.

21. (original) The method of claim 18, wherein the first seed layer is deposited according to a PVD process.

22. (original) The method of claim 21, wherein the second seed layer is deposited according to a deposition process selected from the group consisting of CVD, IMP, SIP, and electroless.

23. (currently amended) The method of claim 18, wherein the ~~plasma source gases~~ first and second plasma treatments consist essentially of plasma source gases selected from the group consisting of argon (Ar), nitrogen ($N_2$), hydrogen ($H_2$), ammonia ($NH_3$), and a nitrogen/hydrogen ($N_2/H_2$) mixture.

24. (original) The method of claim 18, wherein the first and

second seed layers comprise a material selected from the group consisting of Cu, Ti, TiN, Ta, TaN, Cr, CrN, W, and WN.

25. (original) The method of claim 18, wherein at least one of the first and second seed layers is formed of copper or alloy thereof.

26. (original) The method of claim 18, wherein the low-K dielectric comprises a dielectric constant of less than about 3.0.

27. (original) The method of claim 18, wherein the first seed layer is formed having a thickness of about 50 Angstroms to about 300 Angstroms.

28. (original) The method of claim 18, wherein the second seed layer is formed having a thickness of about 100 Angstroms to about 400 Angstroms.

29. (original) The method of claim 18, wherein the diffusion barrier layer comprises a material selected from the group consisting of Ti, TiN, Ta, TaN, Cr, CrN, W, and WN.

Claims 30-41 cancelled

42. (new) The method of claim 1, wherein both the first and second seed layers comprise copper.

43. (new) The method of claim 18, wherein both the first and second seed layers comprise copper.

44. (new) The method of claim 1, wherein the insulator layer comprises a porous low-K dielectric insulator.

45. (new) The method of claim 18, wherein the insulator layer comprises a porous low-K dielectric insulator.

46. (new) A method for forming a copper damascene seed layer with improved seed layer step coverage to reduce void formation during ECP comprising the steps of:

providing a damascene opening formed in a porous insulating substrate;

forming a diffusion barrier layer to line the damascene opening;

then forming a first seed layer on the diffusion barrier;

then plasma treating the first seed layer in-situ with a first treatment plasma consisting essentially of plasma source gases selected from the group consisting of argon, nitrogen, hydrogen, and $NH_3$;

then forming a second seed layer on the first seed layer;

then plasma treating the second seed layer in-situ with a second treatment plasma consisting essentially of plasma source gases selected from the group consisting of argon, nitrogen, hydrogen, and $NH_3$; and,

depositing a copper layer on the second seed layer according to ECP to fill the damascene opening.

47. (new) The method of claim 46, wherein the first and second plasma treatments consist essentially of plasma source gases selected from the group consisting of argon (Ar), nitrogen ($N_2$), hydrogen ($H_2$), ammonia ($NH_3$), and a nitrogen/hydrogen ($N_2/H_2$) mixture.

48. (new) The method of claim 46, wherein the porous insulating layer comprises a low-K dielectric having a dielectric constant of less than about 3.0.

49. (new) The method of claim 46, wherein the first seed layer is formed having a thickness of about 50 Angstroms to about 300 Angstroms.

50. (new) The method of claim 46, wherein the second seed layer is formed having a thickness of about 100 Angstroms to about 400 Angstroms.

51. (new) The method of claim 46, wherein the first and second seed layers are substantially oxide free prior to deposition of the copper layer.

52. (new) The method of claim 46, wherein the first and second seed layers comprise copper.